

Science and Technology

The Naval science and technology (S&T) vision is to: sponsor scientific research and develop technology in pursuit of revolutionary capabilities for U.S. Naval forces of the future; mature and transition S&T advances to improve naval capabilities; respond to current critical needs and maintain broad technology investments; counter potential technology surprises. To support this vision, the science and technology portfolio must provide solutions that will enable the future force while simultaneously seizing opportunities to enhance current readiness and to build capabilities.

The NAE has developed a technology planning document entitled *Naval Aviation Capability Needs 2030-2050*, which will guide long-term aviation research efforts. All plans and programs are executed in partnership with the Office of Naval Research, the Defense Advanced Research Projects Agency, and the Director of Defense Research and Engineering. Coordination of this program with the other services, industry partners, and academia is an essential part of the planning process.

Marine Corps Aviation has its own additional science and technology requirements to create and maintain network-enabled and digitally interoperable expeditionary aviation combat elements postured to execute responsive, persistent, lethal, and adaptive full-spectrum operations as directed by Marine Corps or joint force commanders.

Marine Corps Aviation S&T is an integral part of the larger Naval Research efforts, and is a collaborative effort between the Deputy Commandant for Combat Development and Integration, the Marine Corps Systems Command, the Program Executive Officer for Land Systems, and the Office of Naval Research.

FUTURE WARFIGHTING CAPABILITIES

Naval Aviation is a critical element of a mobile and flexible fighting force capable of rapid response with minimal host-nation support. To deter adversaries and reassure allies, Navy and Marine Corps Aviation provide long-term, persistent functions that move forcibly when required. These capabilities will be provided through increased use of unmanned aerial systems in a broad range of missions. Automated systems will decrease the number of personnel required ashore and afloat. Combatant commanders will expect systems to work in concert with space-based systems and joint assets to provide nearly omniscient intelligence. Systems will decrease in size and increase in performance. Communication throughout the battle space will be secure and reliable and provide information in real time. The seamless integration of information from intelligence and surveillance resources will help build a common operational picture. New weapon technologies will allow faster responses and enable precision advanced lethal and non-lethal effects to meet emerging threats. Timely support and lift from sea bases also will be provided.



SCIENCE AND TECHNOLOGY PLANNING AND INVESTMENT

To meet current and emerging warfighter needs and to deliver future force capabilities, the Naval Research Enterprise invests in research based on a variety of time frames to provide the best technology solutions. The S&T portfolio must be balanced to ensure that near-term warfighting needs are addressed without sacrificing the pursuit of mid- and long-term revolutionary capabilities. To do this, innovative solutions must be developed through investments in the three components of S&T: near-term (0-5 years) efforts that demonstrate mature technology in relevant operational environments and facilitate transition of technology to acquisition; mid-term (6-15 years) efforts that translate research into militarily useful technology applications; far-term (16+ years) research that creates new understanding for technologies that offer paradigm-shifting capabilities. The distribution or balance among these efforts is continuously monitored through the use of S&T roadmaps, which count on insight and flexibility to make adjustments as needed.

ENERGY

Energy reform is a priority for Naval Aviation. Technological and operational efficiencies can enhance significant warfighting capabilities, allowing aircraft to fly longer, faster, or farther on the same amount of fuel while also providing significant cost savings. Naval Aviation will seek to increase fuel efficiency and to reduce overall fuel consumption through changes to operating procedures and policy, and the integration of technologies for improved engine performance, flight management, and simulation. In keeping with the Secretary of the Navy's challenge to the service, Naval Aviation will incorporate fuel efficiency and fully burdened cost of fuel into the acquisition process, demonstrate game-changing technologies, and support certification of aircraft for use with alternative fuels. While advancing fuel efficiency and alternative fuel use, Naval Aviation will ensure that current readiness levels and combat capability are maintained or improved. Senior leaders must nurture a culture change emphasizing energy as a strategic resource, and every Sailor and Marine must embrace operating under fuel-efficient procedures and policies.

NAVY AND MARINE CORPS AVIATION SCIENCE AND TECHNOLOGY OBJECTIVES

The Navy and Marine Corps Aviation science and technology objectives represent the goals of the S&T program, and are used as the baseline for identifying, aligning, and synchronizing investment efforts throughout the enterprise. These objectives represent a broad strategy that provides strong direction for the future, but that also retains sufficient flexibility to allow the S&T community to meet emerging challenges. They were developed in concert with warfighters and technologists and are in alignment with national, defense, and Naval strategies and visions.

REPRESENTATIVE NAVY AVIATION OBJECTIVES

- ♦ **Anti-Air Warfare Performance:** Develop targeting and engagement systems and weapon technologies to detect, track, identify, and engage advanced air threats outside of enemies' projected sensor ranges and the kinematic range of emerging missiles in an electronic-attack environment.
- ♦ **Wide Area Search and Detection:** Develop technologies to enable automatic detection and discrimination of small targets from all altitudes and/or ranges, and improve active/passive/multistatic identification algorithms to minimize false detections.
- ♦ **Persistent Capability to Engage Time-Critical Targets:** Develop technologies that enable all-weather endurance over a large area of responsibility and neutralization of a range of time-critical targets in multiple locations, including ballistic missile launchers, surface-to-air missile systems, small buildings, light bunkers, lines of communication, and vehicles in the most challenging of scenarios, with little collateral damage.
- ♦ **Improved Vertical Delivery Air Vehicle:** Develop technologies for air vehicle enhancements that improve durability, speed, range, payload, and take-off/landing performance capabilities required to increase tactical effectiveness and survivability in all weather.
- ♦ **Enterprise Platform Enablers:** Develop new technologies to enable legacy and future systems to provide long-range, persistent, flexible, and responsive capabilities that assist and strengthen our forces and those of our allies and partners. Research areas such as advanced propulsion and power (including hypersonic capability), energy efficiency, advanced material development, omniscient intelligence, and systems integration are considered key elements of this objective.
- ♦ **Tactical Decision Support:** Develop technologies to enable rapid and accurate decision making. Technologies can include intelligent agents or decision aids for rapid and reliable threat/intent determination, distributed weapon/sensor coordination, real-time operations, and improved mission planning.
- ♦ **System Affordability:** Develop and implement methods and technologies that predict and identify performance problems and reduce the development, support, maintenance, and acquisition costs of Naval systems, including air platforms, weapons, training systems, and aircraft carriers.
- ♦ **Improved Warrior Performance:** Develop technologies to reduce operator workload, mitigate stress (both physiological and psychological) and improve warfighter performance and effectiveness.



REPRESENTATIVE MARINE CORPS AVIATION OBJECTIVES

- ♦ Collaborative Networking: Develop technologies that facilitate and provide for network-enabled and digitally interoperable expeditionary aviation combat elements postured to execute responsive, persistent, lethal, and adaptive full-spectrum operations.
- ♦ Advanced Electronic Warfare Systems: Develop technologies that are compatible with Marine Corps follow-on electronic attack platforms as platform requirements are refined. Develop multifunction transceiver arrays that enable future electronic warfare and provide adequate bandwidth, signals intelligence, surveillance, reconnaissance, and NGJ technologies.
- ♦ Sand- and Dust-penetrating Radar: Develop technologies that enable passive obstacle detection at range and precision support of distributed operations in unprepared landing zones for current rotary-wing and tilt-rotor aircraft, and that could be incorporated into future unmanned systems. Develop complementary technologies to precision quality navigation in brown-outs that enable precise non-visual air- and ground-speed reference.
- ♦ Command and Control Data Fusion and Networking: Develop technologies to support data fusion, in order to improve sensor tracking of tactical aircraft and unmanned aircraft systems and to collect data from the various ground and intelligence systems employed by MAGTFs.
- ♦ Standardized Force Tracking System: Develop technologies that provide 100-percent-assured covert, real-time identification of friendly forces for fratricide avoidance as well as battlefield coordination, maneuver deconfliction, command situational awareness, and resupply during future distributed operations.
- ♦ Group 4 Unmanned Aircraft Systems: Develop an expeditionary, all-weather, high-endurance, multimission UAS capable of operating from austere locations and providing networked, interoperable systems to enhance MAGTF and joint commanders' battle-space awareness.
- ♦ Advanced Multi-function Electronic Warfare Transceiver: Leverage NGJ technologies to develop capabilities compatible with Marine Corps follow-on electronic warfare concepts (i.e., system-of-systems distributed electronic warfare, including low-observable systems) as the system requirements are refined.
- ♦ Ground-Based Command and Control and Surveillance Systems: Develop technologies that support the calibration of an ambient air-cooled active electronically scanned array. Develop manufacturing techniques that can produce high-quality, micro-miniature radio frequency circuits that are not susceptible to stress and cracking during production.